

REVIEW MATERIAL FOR FINAL EXAM
HONORS COLLEGE ALGEBRA

SOLVING INEQUALITIES --- Linear, Quadratic, Rational, Absolute Value

- 1) What is the key property to remember when solving inequalities?
- 2) When solving quadratic or rational inequalities what kind of graph must be used?
- 3) Solve the following inequalities; Write your solution in interval notation.

a) $\frac{3x+7}{-5} \leq 4 - x$

b) $|4x+3| > -2$

c) $2x^2 + 5x - 1 > 2$

d) $\frac{x+1}{x-3} \leq 2$

EQUATIONS OF A LINE

- 4) What is the slope formula?
- 5) How does the slope of a line relate to the graph of the line?
- 6) What is the point-slope form of a linear equation?
- 7) What is the slope-intercept form of a linear equation?
- 8) What is the standard form of a linear equation?
- 9) What relationship do the slopes of parallel lines have?
- 10) What relationship do the slopes of perpendicular lines have?
- 11) Write the slope-intercept and standard form of the line that
 - a) goes through (5,1) and has a slope of 0.
 - b) goes through $(-4, 13)$ and is perpendicular to the x-axis
 - c) has an undefined slope and $f(-8) = 4$
 - d) goes through $(-1, 3)$ and $(3, 4)$.
 - e) goes through $(3, -1)$ and is parallel to $x - 2y = 4$.

TRANSLATIONS-REFLECTIONS-SCALINGS-SYMMETRY

- 12) Given the equation $y = x^3$, write the equation that will:
- a) Move the graph up 1
 - b) Move the graph down 7
 - c) Move the graph left 3
 - d) Move the graph right 9
 - e) Move the graph closer to the y-axis/narrower graph
 - f) Move the graph closer to the x-axis/wider graph
 - g) Reflect the graph over the y-axis
 - h) Reflect the graph over the x-axis
- 13) What do you do to determine if the graph of an equation has:
- a) x-axis symmetry
 - b) y-axis symmetry
 - c) origin symmetry
- 14) Determine algebraically whether each equation has a graph which is symmetric with respect to the x-axis, y-axis, origin, or none of these.
- a) $y = x^2 + 2$
 - b) $x^2 + y^2 = 10$

FUNCTIONS

- 15) What is a function?
- 16) What is the domain of a function?
- 17) What is the range of a function?
- 18) How do you find the inverse of a function?

- 19) What are each of the following special functions?

- a) piecewise function
- b) greatest integer function
- c) identity function

- 20) Give the domain and the range for each of the following

a) $y = \sqrt{25 - x^2}$ b) $y = |x^2 + 5| - 9$ c) $y = \frac{3}{7 + x}$

- 21) Given $f(x) = 5x^2 - 2x + 8$ and $g(x) = 2x + 4$. Find

a) $(f + g)(x)$

b) $\left(\frac{f}{g}\right)(-1)$

c) $f(x + h)$

d) $(f \circ g)(x)$

22) Given $f(x) = \begin{cases} [x + .3] & \text{if } x < -1 \\ -x^2 + 3 & \text{if } -1 \leq x \leq 5 \\ |x - 1| & \text{if } x > 5 \end{cases}$ $f(-5) = \underline{\hspace{2cm}}$ $f(5) = \underline{\hspace{2cm}}$

- 23) Find the inverse of $y = 3x - 4$.

QUADRATIC FUNCTIONS

- 24) What is the standard (h,k) form for a quadratic function?
What is the axis of symmetry and vertex for this function?
- 25) What determines which way a parabola opens?
- 26) What determines how wide or narrow a parabola is?
- 27) Give the standard (h,k) form, the vertex, axis of symmetry, x-intercepts, y-intercept, direction, scaling, and a sketch of : $f(x) = 2x^2 - 4x + 5$
- 28) A ball is thrown directly upward from an initial height of 100 feet with an initial velocity of 80 feet per second. Its height is determined by the function $h(x) = -16t^2 + 80t + 100$ where t is the time in seconds after the object is thrown. After how many seconds does the ball reach its maximum height? What is the maximum height of the ball?

POLYNOMIAL AND RATIONAL FUNCTIONS

- 29) What is the Remainder Theorem?
- 30) Use synthetic division to determine if 3 is a zero of the polynomial $f(x) = 2x^5 - 10x^3 - 19x^2 - 45$.
- 31) Use synthetic division and the factor theorem to determine if $x + 3$ is a factor of $4x^2 + 2x + 54$.
- 32) According to Descartes' Rule of Signs how many positive and how many negative real zeros does the polynomial function: $f(x) = x^3 - 2x^2 - 13x - 10$ have?
- 33) Use the Intermediate Value Theorem to show there is a real zero between 2 and 3 for the polynomial function $f(x) = 2x^2 - 7x + 4$.
- 34) Use the Boundedness Theorem to show:
a) there is no real zero greater than 1 for the polynomial function $f(x) = 4x^3 - 3x^2 + 4x + 7$

b) there is no real zero less -2 for the polynomial function $f(x) = x^4 + x^3 - x^2 + 3$.
- 35) Find the polynomial of degree 3 with only real coefficients having zeros of 2 and $3i$; and $f(1) = -20$.

- 36) Given the polynomial function: $f(x) = 4x^3 - 7x^2 + 6x + 2$
- a) List all possible rational zeros
 - b) Find all the zeros and corresponding factors given $1 - i$ is a zero.

GRAPHING POLYNOMIAL AND RATIONAL FUNCTIONS

- 37) When graphing polynomial functions how do odd degree polynomial functions start and end?
- 38) When graphing polynomial functions how do even degree polynomial functions start and end?
- 39) How is even multiplicity shown on a graph of a polynomial function?
- 40) How is odd degree multiplicity shown on the graph of a polynomial function?
- 41) What is an asymptote?
- a) How do you find the horizontal asymptotes of a rational function?
 - b) How do you find the vertical asymptotes of a rational function?
 - c) How do you find the oblique asymptotes of a rational function?
- 42) Give the equations of the vertical, horizontal, and oblique asymptotes for:
- a) $f(x) = \frac{2x^2 + 5x + 3}{x^2 - 6x + 8}$
 - b) $f(x) = \frac{x^2 - 1}{x + 3}$

EXPONENTIAL AND LOGARITHMIC FUNCTIONS

- 43) Give the logarithmic form for the exponential function $y = a^x$:
- 44) What is the base for each of the following: $\log 7$? $\ln 7$?
- 45) Complete the properties of logarithmic functions:
- a) $\log_a(xy) =$
 - b) $\log_a\left(\frac{x}{y}\right) =$
 - c) $\log_a x^r =$
 - d) $\log_a b =$
 - e) $\log_a a =$
 - f) $\log_a 1 =$
- 46) Use the properties of logarithms rewrite $\log_7 \frac{7x^2}{\sqrt[3]{y}}$ as a sum/difference of logarithms.
- 47) Solve the following exponential and logarithmic equations:
- a) $27^{4x} = 9^{x+1}$
 - b) $\log_2 x = 3 + \log_2(x - 4)$
 - c) $6^{1-2x} = 8$
 - d) $\log_6(4x) - \log_6(x - 3) = \log_6 12$